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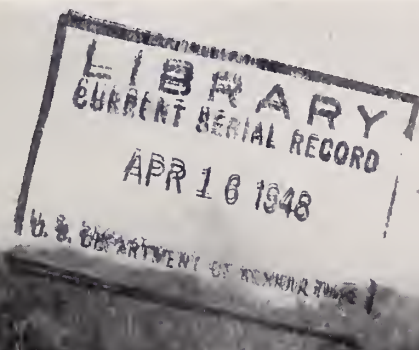
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IN THIS ISSUE

	PAGE
<i>Meat in Relation to World Food Problems...</i>	67
<i>Sorghums Serve Salvadorans for Food and for Feed.....</i>	71
<i>Cinchona in Guatemala.....</i>	74
<i>Wider Horizons for Agricultural Collaboration.....</i>	76
<i>Machine-Tractor Stations in the Soviet Union.....</i>	80
<i>International Agricultural News.....</i>	87

FRONT COVER

Cattle in Peru

A group of cattle used in the livestock-improvement program at the Estación Central de Colonización en Tingo María, Peru.

BACK COVER

World Map—Prewar Meat Production

The prewar annual meat production (average 1934-38) amounted to about 66.1 billion pounds. Production by country varied from 87 thousand pounds in Paraguay to more than 16 billion pounds in the United States.

NEWS NOTES

Director Wheeler Leaves OFAR

Effective March 1, *Leslie A. Wheeler* resigned as Director of the Office of Foreign Agricultural Relations,

a position he has occupied since 1939. Mr. Wheeler has entered the Foreign Service, as Counselor of the United States Embassy in Mexico.

At the same time, Secretary of Agriculture Clinton P. Anderson announced the appointment of *Fred J. Rossiter* as Associate Director of OFAR, and acting director pending designation of a Director.

Mr. Rossiter, upon graduation by Iowa State College in 1920, entered agricultural mission work in China, beginning 11 years, altogether, of experience in the Far East. He served in Europe during World War I in naval aviation. He has been with OFAR since 1930, including 5 years as assistant agricultural attaché in China. Since 1940, he has headed OFAR's Fats and Oils and Rice Division.

Mr. Wheeler leaves the Department of Agriculture after 22 years of service, first in the Bureau of Agricultural Economics where he became chief of the Foreign Agricultural Service, and since 1939 Director of the Office of Foreign Agricultural Relations. He has been a member of numerous United States delegations to international agricultural and economic conferences and is chairman of the International Cotton Advisory Committee and of the International Wheat Council.

John V. Hepler Goes to Central and South America

John V. Hepler, Head, Extension and Training Division, Technical Collaboration Branch, OFAR, left Washington on March 7, for Central and South America. He will visit El Salvador, Panama, Colombia, and Peru, spending a few weeks in each country in the interest of extension programs in these countries.

FOREIGN AGRICULTURE


HALLY H. CONRAD, EDITOR

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Meat in Relation To World Food Problem

Meat-producing areas and international movement of meat could not fail to escape the adverse effects of World War II. The over-all situation of meat in 1946 and 1947, however, was somewhat different in volume and distribution from that of 1938.

by ELMER A. REESE



Meat from cattle, hogs, and sheep has provided the peoples in the temperate and colder climates of the world with an important part of their diet for many centuries. These types of livestock have furnished a practical means of utilizing agricultural resources, such as fodder, pasture, other forages, and surplus grains, and a means of storing such crops for subsequent use. Thus, livestock not only conserves grain and forage for use in winter periods in colder climates but also supplies the meat and animal fats which have been important in the diets of the people in these areas throughout the years. Also, byproducts obtained from livestock in the form of hides, skins, pharmaceutical products, fertilizers, and other related products have filled a most important economic and social need in the world.

In countries where crop and forage resources permit meat-eating habits, production patterns have developed beyond the mere conservation of feed resources and diet requirements. Production of meat in such countries has become an outlet for surplus grains. In other countries, the need of the population for other food, for direct human consumption, practically precludes the development of the livestock and meat industry, and logically the consumption of meat per capita is low. In still other countries, especially pastoral countries, production of meat exceeds the domestic needs of the people, and considerable quantities are available for export to countries able to buy.

Accumulations of grain and feed surpluses that existed at the beginning of World War II and the subsequent demand for meat affected the world production, trade, and consumption of this commodity. Likewise, the shortage of grains since the war has tended to reduce meat-producing potentialities. These factors, together with the inability of deficit countries to import, have influenced the world posi-

tion of meats. Another factor affecting trade is the strong consumer demand in surplus-producing countries.

Tropical areas have never been important as producers and consumers of meat. Other food is more readily available, and the conditions for animal production are less favorable than in temperate climates. In these areas, however, the presence of people accustomed to eating meat and modern handling and transportation have created some demand.

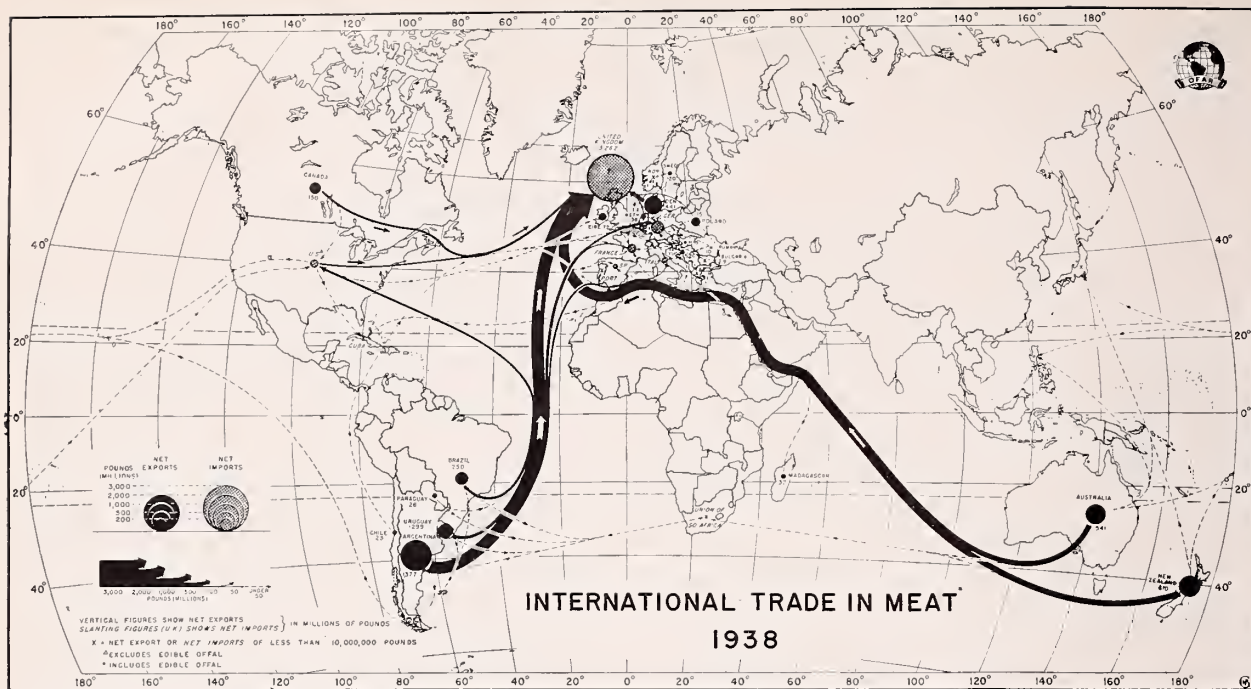
International Trade

Meat entering into international trade in 1947 varied considerably in both volume and pattern of distribution from that in 1938 (see map I) and to some degree it differed from that of 1946 (see map II). Basically, the principal meat exports of the world come largely from a relatively few countries or areas in North and South America and the southern Dominions of Australia and New Zealand.

Exports from North America in 1946 were substantially augmented by the demand for meat arising as a result of the European relief program. Most of those exports went to the war-devastated, and other, areas in Europe where the indigenous production had been low. Almost 35 percent of the supplies that entered into world meat trade in that year originated in the United States and Canada, about 40 percent in South America, and nearly 25 percent in Australia and New Zealand.

In 1947, the volume of exports from the principal livestock countries was also increased considerably over the prewar level because of a higher domestic production. The exporting countries in North America shipped out almost six times as much meat in 1947

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Map I.—In 1938 nearly all the net exports of meat went to western Europe.

as they did in prewar years, whereas South America and Oceania (Australia and New Zealand) increased their trade almost 12 and 18 percent, respectively, from prewar levels. On a net export basis, it is estimated that the volume of exports reached 4.2 billion pounds in 1947, compared with 5.1 billion pounds in 1946 and 3.2 billion in the prewar period.

In addition to the increase that occurred in the volume of meat exports during and since the war, there is another significant aspect related to the international trade of meat. This concerns itself primarily with the shift or change that has occurred in the pattern or distribution of meat exports in 1947 as compared with that of prewar years.

Prior to World War II, the eastern and southeastern countries of Europe exported relatively large quantities of pork products, especially bacon and ham, to the United Kingdom and central, western, and southern Europe. Exports from these countries, obviously, were discontinued when hostilities began, and apparently they have not been resumed to any noticeable degree since. Likewise, the export trade in meat and live animals which existed with the Middle East prior to the war is believed to have been completely discontinued.

In addition to the intracontinental meat trade, Germany imported beef and veal primarily from

Argentina and smaller quantities from Uruguay. Such export activities, apparently, were terminated by the shipping blockade and in all probability will not be resumed.

Other changes in the meat-export trade of the world have occurred since prewar years. For instance, in 1940, the United States changed from a net importer of meat to a net exporter. The quantity exported in 1947, however, was less than 300 million pounds, which was shipped to the Philippines, the Caribbean areas, and the Latin American Republics. The Caribbean areas and the Latin American Republics are traditional customers and have always depended primarily on the United States for their meat imports.

Mexico during the past 2 years has become an exporter of meat, largely because of infiltration of foot-and-mouth disease into that country, which caused the border to be closed to the export of live cattle. The principal types of cattle previously exported, mostly to the United States, were stocker and feeder cattle. Since the surplus-cattle-producing area of northern Mexico is not infected with the disease, slaughterhouses and packinghouses are being established for processing animals, in excess of current domestic needs, for the export trade.

During the prewar period, Finland, the Netherlands, Poland, Sweden, and Yugoslavia were net meat ex-

porters, but in 1946 and 1947 these countries became net importers. The Soviet Union is still a net importer of meat.

Aside from the United Kingdom, the continent of Europe will become more of a deficit meat area, because meat imports from eastern and southeastern Europe are limited, indigenous production will be less, and foreign exchange is short and in many instances may not be available for the purchase of meat. An early restoration of livestock numbers to prewar levels in continental Europe does not appear to be in prospect at this time. Shortage of feed supplies and the probable reduction that occurred in the number of breeding animals, as a result of last year's heavy slaughter, obviously preclude any such optimism. Consequently, meat supplies for the immediate future will be limited. Any increase in the indigenous production will be slow, and imported meat supplies will depend on a new, as well as an available, source of supply, and on the availability of foreign exchange with which to purchase meat.

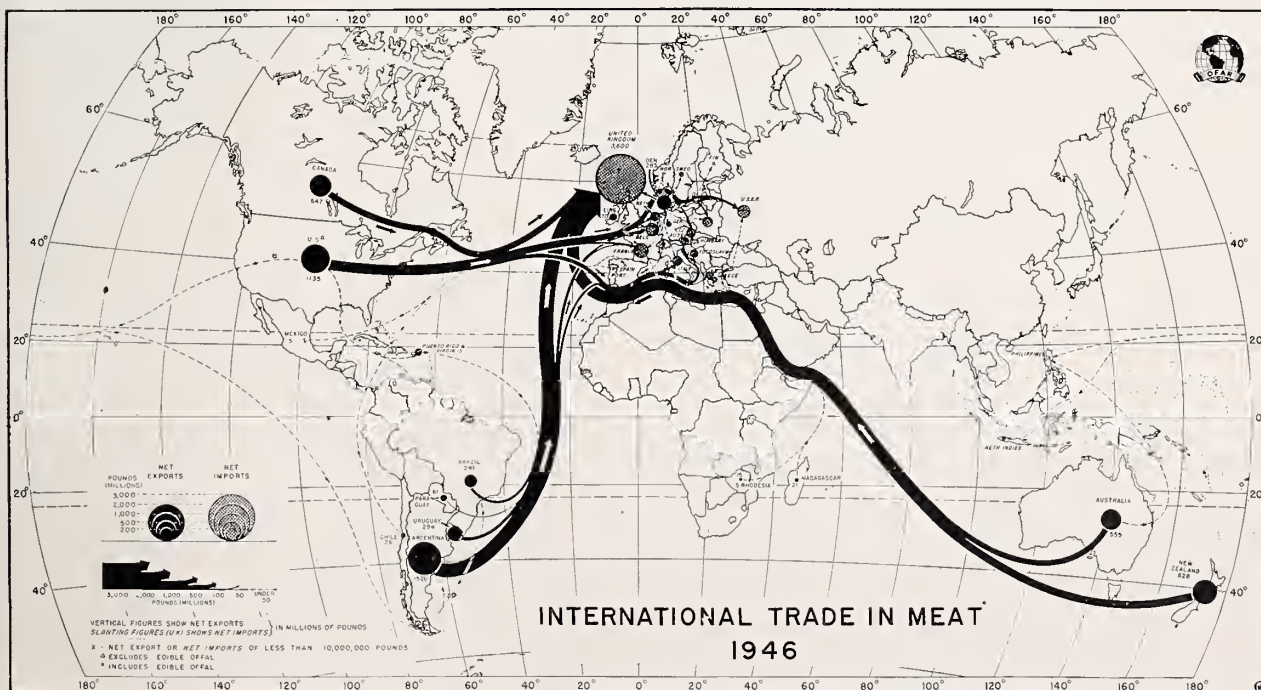
From the standpoint of world import trade, the United Kingdom, the principal market, imported an estimated 3.5 billion pounds in 1947. This figure is only about 120 million pounds larger than the prewar total, but, nevertheless, it represents over 90 percent of the total net imports. In the prewar years,

these imports or supplies, except for some additional imports from continental Europe, were obtained chiefly from Argentina, Brazil, Canada, Australia, New Zealand, and Denmark. Present deliveries from these countries are being made on the basis of agreements consummated during the war and later extended to the postwar period. Imports by the United Kingdom in 1946 and 1947 indicated a slight progressive increase over prewar takings, but they were not large enough to make up the supply deficiency.

Imports available to the other importing countries in 1947 were estimated to be slightly less than 10 percent of the total net imports. Although the quantity available was limited, possibly it was all that could be purchased by these countries because of their foreign-exchange situation.

Consumption

The consuming countries of the world were estimated to have had available and apparently consumed about 63.6 billion pounds of meat in 1947. Although this is about 6 percent greater than the amount available for consumption in 1946, it is about 4 percent below the comparable prewar figure. During the same period (prewar through 1947) the population of the principal meat-consuming countries increased by almost 6 percent. (See map, back cover).



Total meat supplies in the principal producing countries of the world in 1947 were larger than the annual supplies available in any recent years. More meat became available last year primarily because of the heavier-than-seasonal slaughter that took place. More animals were slaughtered as a result of the drought in Europe last summer, a generally short feed situation in many parts of the world, and a large consumer demand for meat. This was particularly true in Europe, Canada, Argentina, and the United States.

Although total meat supplies in 1947 were abnormally large as a result of the heavy slaughter and liquidation of hogs and cattle, particularly, many of the producing countries did impose restrictions for the purpose of conserving supplies for export and domestic use. Such restrictions were and still are in effect in Canada, Denmark, Australia, New Zealand, Argentina, Brazil, and perhaps in other countries. They consist of export controls, embargoes on exports, and rationing. Many of the importing countries continue some form of consumer control, such as rationing, limiting meat sales to certain days of the week, and, in a few instances, restricting consumer weekly purchases to whatever quantity a certain amount of money will buy.

Generally, the per capita consumption of meat in the principal exporting countries continues at relatively high levels as compared with that in non-exporting meat-producing countries and meat-importing countries of the world. Meat consumption in Europe during 1947 in comparison with 1946 was apparently about the same, or slightly less, in nearly one-third of the countries and somewhat higher in the others. However, per capita consumption was below that of the prewar years in practically all the countries, except Denmark, Eire, and Czechoslovakia.

In 1947, the per capita meat consumption in the United States, Canada, Mexico, Denmark, Eire, Czechoslovakia, and the Union of South Africa increased and is now larger than in prewar years. New Zealand, Australia, and Argentina continued to have the highest per capita consumption of meat, but the present average per person is somewhat smaller than in prewar years. The lowest per capita consumption of meat occurred in such countries as Portugal, Italy, Bulgaria, Brazil, and Greece.

As a general rule, the exporting countries of the world tend to consume greater quantities of meat per capita, and importing countries smaller amounts. Therefore, it is only reasonable and logical to assume

that, as long as the exporting countries are producing a relatively plentiful supply of meat at low costs, they are going to consume a larger quantity of meat and a smaller quantity of other foods that are not perhaps as nourishing or plentiful. However, if demand forces the prices of meat upward, the assumption is that the rate of domestic consumption per person will decrease proportionately.

In view of the present and prospective feed situation, the sizable reduction in livestock numbers last year, and the present tendency of exporting countries to increase domestic consumption, the general belief is that in the immediate future meat-import requirements or needs of the world will exceed the probable supplies. In Argentina, for instance, the population is believed to have increased substantially since prewar years. This increase, coupled with a high purchasing power, has resulted in an unusually large consumer demand for meat during the past year. This situation has resulted not only in a greater demand for beef but also for a better quality of beef. Consequently, the higher domestic price has attracted steers of export quality. If this demand continues, possibly Argentina's exportable surplus will be affected.

Brazil, in all probability, would have no exportable surplus if adequate storage, refrigeration, and transportation facilities were available in that country. Smaller supplies are in prospect in the United States, and the continuation of high consumer demand will surely preclude any sizable exports for several years. The Canadian exportable surplus is smaller, and consumer demand is greater. Situations of increased domestic demands and limited supplies prevail in other countries.

From the viewpoint of international trade and consumption of meat in the immediate future, particularly in the light of prospective supplies, it appears evident that the trend in trade and per capita consumption for most of the meat-consuming countries of the world will be downward for the next few years. Lower indigenous supplies and smaller imports are anticipated. Consequently, the volume of meat entering international trade in the immediate future is likely to be below that of 1946 and 1947. The United States, normally a large producer, is not expected to be in a position to export meat for several years, and in some other countries basic resources, such as livestock numbers and feed supplies, will not be sufficient to warrant exportation for some time. The exports from most of the producing countries are likely to be affected by the strong domestic demand within those countries.

Sorghums Serve Salvadorans For Food and For Feed



by JAMES M. WATKINS

In the Republic of El Salvador, sorghum is one of the most important crops for food and livestock feed.

It can be found growing in many parts of the country, in the good crop regions as well as on the poorer soils where corn does not grow well. In areas around Metapán, in the northern section of the Republic, where the soils are heavy and stony, sorghum is about the only agronomic crop which is tolerant of the conditions. The total outturn is about two-thirds as great as that of corn, the number-one food crop (table 1). The high average yield per acre of sorghum indicates one of the reasons why this crop is able to compete with corn.

As a food crop, sorghum serves the people in various ways. The grain may be used for tortillas, when corn is not plentiful, either alone or mixed with corn. It is sometimes roasted and included with coffee to make a milder blend and also to pad the amount of the coffee. On occasions the roasted grain is put in candy for a preparation somewhat like the popcorn balls of the United States. With the many uses of this grain, it could be easily classified as one of the important food crops of El Salvador.

The leafy portion of the plant is commonly employed as a part of the livestock feed. The forage remaining after the grain harvest may be utilized as cut feed or it may be grazed off by the animals. When the growth is cut back early, new shoots appear rapidly, and several cuttings can be had in a year from one seeding. On moist soils the growth is heavier than on the dry soils. As a soiling crop more tonnage can be obtained per year than when it is left for grain.

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This article is a contribution from the Centro Nacional de Agronomía of El Salvador, a technical agricultural service organization for El Salvador, operated jointly by the Government of El Salvador and by the Office of Foreign Agricultural Relations, U. S. D. A. This study was made possible by funds provided through the U. S. Interdepartmental Committee on Scientific and Cultural Cooperation and funds from the Government of El Salvador.

Methods of Production

The most common method of planting sorghum is to seed it in with corn in July after the corn crop is well established. Sorghum may be seeded in the row, or in between rows, of corn. If planted in May, the corn matures in August, after which time the sorghum makes most of its growth. This procedure gives double use of the land and provides for earlier seeding of the sorghum than if it were necessary to wait until the corn was removed. In the regions where corn does not grow well, sorghum is seeded alone and perhaps thicker than when mixed with another crop. Ordinary spacing of rows is about 30 to 36 inches, with hills spaced 20 to 30 inches apart in the rows. The method of planting is the same as that of corn. Rows are made with an ordinary plow; the seed is planted by hand and covered with the foot. Cultivation, two or three times during growth, is accomplished with a cuma (large knife) and the ordinary plow.

Introduction of New Varieties

In line with the improvement program of field crops conducted by the Centro Nacional de Agronomía, the cooperative technical-service organization for the Agriculture of El Salvador, sorghum has received considerable attention. The "native" variety is a tall-growing type with a hard white seed. Regardless of the date of seeding, whether May or July, the grain usually matures in November and December. This means about 5 or 6 months for maturity. Recently the appearance of certain diseases on the plants has stimulated more interest in the improvement of the crop.

In 1945, the striking results of 3 new introductions—Early Hegari, Early Kalo, and Shallu—were encouraging. The first two are small, fast-growing

Table 1.—Production and yields of corn and sorghum in El Salvador, 1944-45

Crop	Production	Average yield per acre
Corn.....	1,090 pounds	Pounds
Sorghum.....	340,834	900
	213,043	1.060

ANUARIO ESTADÍSTICO, 1944. El Salvador.

varieties with compact heads. Early Hegari has white seed, and Early Kalo a red grain, which has attracted much attention from the public. Shallu grows taller than the other two varieties and has an open head with hard white seed. These three varieties mature in 70 to 90 days, and each will produce three crops a year from the same seeding if planted in early May. The last harvest, however, is never so large as the first two. This rapidity of maturity makes the varieties especially attractive in comparison with the native variety, which gives only one harvest per year.

Yields from these varieties were computed (table 2) from small unit areas and represent about what may be expected from plantings under conditions similar to those at San Andrés. With further investigation, better varieties may be found. In a trial planting in 1947, the first harvest of Arizona Hegari (a newly introduced variety) returned an average of 3,500 pounds per acre.



Shallu is a particularly valuable newcomer in El Salvador. This variety matures early, yields heavily, and has white grain borne in an open-type head.

TABLE 2.—Yields per acre of specified sorghum varieties from test plots at San Andrés, El Salvador

Variety	Average yield per acre			
	First harvest	Second harvest	Third harvest	Total
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Early Hegari.....	2,030	1,270	530	3,830
Early Kalo.....	1,980	1,410	450	3,840
Shallu.....	2,230	1,760	(1)	3,999
Native.....	3,280			3,280

¹ Data for third harvest not available.

Results from these varieties grown in other areas have been variable. One farmer growing Early Hegari obtained 5,400 pounds per acre under conditions prevailing on his farm. Other reports have not been so favorable, and more information is needed concerning the growth of these new varieties in other areas of the country.

In 1946 several other new varieties were introduced and tried out in experimental plots. There was considerable variation in the length of maturity of the varieties. Most of the introduced varieties mature seed in a short time, compared with native sorghum. Height of growth was also variable; some were very tall and others appeared as dwarf types. In general the height represented the type that is exhibited in the region from which they came. Grain types are usually short and sweet sorghums tall.

Thus far the grain types have aroused more interest than the sweet varieties. Sorghum is grown in El Salvador mostly for grain. Sweet varieties have little chance in competition with sugarcane, but the general opinion is that they will be important in a feed program as silage and to mix with other forages. Silage has been successfully made from Early Kalo in a trench silo, and it appears to offer promise for this use. Early maturing varieties present the problem of how to protect the seed when the crop matures in the wet season from May to October. During this time good silage can be made, and the last harvest could be used for seed if needed for that purpose. The second and third harvests would come during the dry season, when the drying of seed is no problem.

In 1947 several additional varieties of sorghum were obtained for the test plots. In all, 74 varieties have been grown for trial. In both 1946 and 1947 the test plots were seeded in July so that the information obtained was not so complete as it should have been.

Place of New Varieties in El Salvador

The cropping system usually accepted in El Salvador does not follow the pattern understood as a complete

rotation. The most common practice is to plant corn followed by beans each year, with the corn seeded in May and the beans planted in with the corn the following August. In some instances sorghum is seeded instead of beans. Where a crop like rice, cotton, or sugarcane is planted, that one crop occupies the land the entire year. If sorghum is grown, such as one of the varieties discussed, it must occupy the land for the entire year to be used as needed; or it may be planted in May, harvested in July or August, and then removed for another crop, such as peanuts, beans, cotton, tobacco, a green-manure crop, or a late seeding of corn. This latter procedure seems to offer much promise in the use of the new varieties. They would fit into short rotations and give greater use of the land. However, with the yields that have been obtained from some of the tests, the place of the new varieties should not be a question.

Selection and Improvement Work

Testing has not been conducted long enough with most of the new varieties to determine which should be increased on a large scale for general use. Early Hegari, Early Kalo, and Shallu have been grown in various places, tried out, and found to be outstanding in many respects. In the process of growing them for distribution, some variation in seed was noticed. In order to obtain pure seed, the plots for increase were rogued each time, and in 1947 the effect of this work was evident. Early Kalo showed uniformity and appeared to be fairly true to type. This variety attracts much attention, and the demand for it has been greater than for the other two varieties offered to farmers.

There are several other new varieties which appear to offer promise, and which will receive special attention. Only one harvest is available from 1947, and it is early to say which of the varieties grown will be best.

The great importance of sorghum in El Salvador and the possibilities offered by the new varieties should warrant considerable investigational work on this crop. Any prediction concerning the use of introduced varieties would be premature as yet, although from present indications they appear likely to become very important. Much can still be accomplished in testing out the available varieties for conditions prevailing in El Salvador. Although the native variety has a disadvantage in that it is late maturing, the seed are hard and seem to be less susceptible to insect injury. It can probably be used to great advantage in breeding combinations with some of the more outstanding of the introduced varieties.



Early Kalo, which gives good results in El Salvador, has red grain in compact heads.

Cinchona in Guatemala



Germinating seeds under controlled conditions of light, temperature, and humidity.

The cinchona growers of Guatemala have worked many years to develop this crop for the high-altitude volcanic slopes above their coffee groves. Individuals, the Cinchona Growers Association, and the Instituto Agropecuaria Nacional are working together in research to develop high-yielding, disease-resistant clones, better grafting methods, and the most desirable planting and cultivation practices to assure a Western Hemisphere supply of essential quinine and other medicinal derivatives.

The Instituto Agropecuaria Nacional is a Cooperative Agricultural Experiment Station operated jointly by the Governments of Guatemala and the United States through the Office of Foreign Agricultural Relations, U. S. D. A.

This research was made possible by funds provided through the U. S. Interdepartmental Committee on Scientific and Cultural Cooperation.



Drying bark from 3½-year-old plantation.



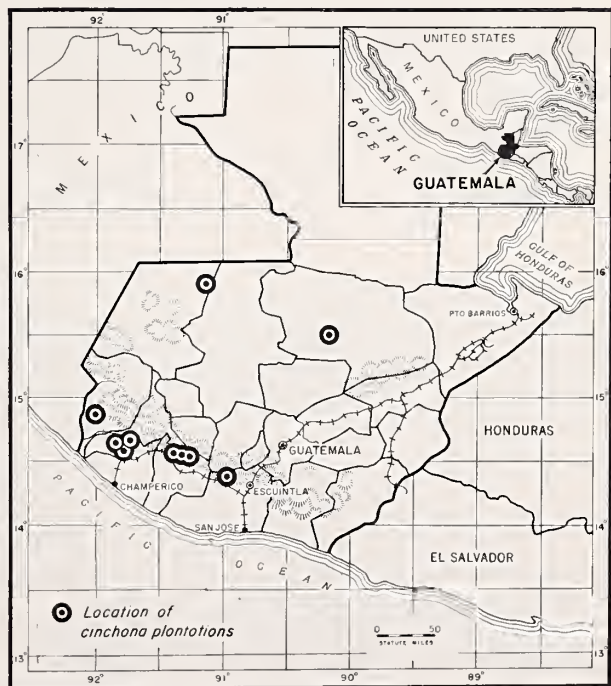
Healthy rootstock bench-grafted to high-yielding scion.



Bark harvest from 3½-year-old planting.



Alkaloids from cinchona bark are processed into anti-malarial tablets.



Southern slopes of Guatemalan highlands offer desirable conditions for cinchona plantings.

Wider Horizons for Agricultural Collaboration

"Knowledge is one thing which, if given away, does not diminish your own store; indeed, it is the gift most certain to be returned to you increased manifold," Under Secretary N. E. Dodd recently said. This is the fundamental approach to the broadened program of technical collaboration in agriculture which the Congress has authorized.



by QUINCY EWING

A great deal of public attention has centered on provisions of the United States Information and Educational Exchange Act of 1948 regarding the dissemination abroad of information about the United States. This has perhaps obscured separate provisions of the act which are of great interest agriculturally, in view of broad world efforts to overcome agricultural and food-supply problems.

These separate provisions of the act (Public Law 402, 80th Congress), extend the authorization for an "educational exchange service to cooperate with other nations." The expanded authority for programs directed toward the sharing of scientific, technological, and educational advancement for mutual advantage permits the extension to other countries of agricultural technical collaboration heretofore limited to the Western Hemisphere, Liberia, and the Philippines.

While the act embraces a wide field of science and culture, the importance of agriculture to so many of the world's people makes the agricultural phases of international technical collaboration of particular

importance. One of the objectives of the act is to enable the United States, in cooperation with other countries, to help implement more rapidly policies of world agricultural development to which this country and many others, members of the Food and Agriculture Organization of the United Nations, have subscribed.

In carrying on the educational exchange service, the act authorizes—

the interchange of persons, knowledge, and skills; the rendering of technical or other services; the interchange of developments in the field of education, the arts, and sciences.

A pattern for this type of collaboration in agriculture between the United States and other countries has already been worked out, in programs under way with tropical American countries for 6 years, and in the organizing of agricultural missions to the Middle East, China, and the Philippines. These already existing programs—now broadened by Public Law 402—have been carried on under Public Law 63 and other authority.

United States collaboration in agriculture in the Western Hemisphere has been carried out by the United States Department of Agriculture, primarily through its Office of Foreign Agricultural Relations and the Bureau of Plant Industry, Soils and Agricultural Engineering, in cooperation with the Department of State through the Interdepartmental Committee on Scientific and Cultural Cooperation. Implementation has been through Memoranda of Agreement with governments of other American Republics. Under these agreements, the United States has supplied technical equipment and personnel for agricultural stations, and the cooperating countries have furnished physical properties, labor,



Cacao beans drying in the sun at a cooperative agricultural station in Ecuador. Workers stir the beans by walking across the drying patio.

Quincy Ewing is Information Specialist, Publications Division, O. F. A. R.



Members of U. S. Agricultural Mission and officials observe one method of irrigation in the Middle East. The water wheel is operated by local draft animals—a donkey, cow, ox, or horse.

and local technicians to work with United States specialists.

In addition, the program has made possible the training in the United States of a limited number of foreign technicians, and the Department of Agriculture has sponsored, jointly with the Department of State, agricultural missions which, when invited to do so, have visited other countries and collaborated with officials there in agricultural studies and planning. These missions have been largely composed of outstanding specialists of the Land Grant Colleges.¹

Under the broadened authority of Public Law 402, and in cooperation with the other governments concerned, it is planned to extend this general pattern, as conditions develop to permit effective action, to the Eastern Hemisphere in a wide east-west belt including the Mediterranean Basin, the Arabic countries, Liberia, southern Asia, China, the Philippines, and non-self-governing islands of the South Pacific.

In some of the areas, it might be pointed out, further cooperative work would be built upon foundations already laid by the work of the agricultural missions to the Middle East, China, and the Philippines.

¹ HEPLER, JOHN V. AGRICULTURAL COLLABORATION WITH FOREIGN COUNTRIES. Foreign Agr. 12:14-17, illus.

The "increase [of] mutual understanding between the people of the United States and the people of other countries," which is a principal declared purpose of the act, will be aided by scientists and educators of various countries working together in a program of technical collaboration for the mutual benefit of their nations. And scientists have long recognized that scientific knowledge grows through the interchange of knowledge, enriching all parties to the interchange.

Still more concrete and specific mutual benefits, however, also underlie the program of agricultural technical collaboration as it has been worked out in practice between the United States and other, neighboring American countries. This program has stressed the development of complementary crops.

The United States is a large consumer of such crops as cocoa, rubber, quinine, hard fibers, and of certain drugs, flavorings, and insecticides which we do not have the climate to produce. Such crops are grown, or can be, in American countries to the south of us. These other American countries benefit by selling more of their crops, as the efficiency of their production is increased through research and extension work. The United States, on the other hand, has a more adequate and secure supply of the commodities. Fur-

thermore, the producing countries have greater purchasing power, some of which they may use in the United States to secure goods which we produce to advantage.

It is advantageous in other ways among neighbors, too, that each should have well-developed agricultural technologies and should be accustomed to working together on agricultural problems. One of these advantages lies in the control of crop and livestock pests and diseases. These, as they spread, have small respect for national borders. Rigid quarantines may, or may not, succeed in keeping them out of a country and in any case are costly and cumbersome. Where the level of agricultural technology is high, greater success usually attends efforts to keep out such pests and diseases or to control them.

The wider application of programs of technical agricultural collaboration may help to implement the policies to which 55 nations, including the United States, are pledged in the Food and Agriculture Organization of the United Nations. Congress recognized the important relationship of scientific and educational collaboration with the work of the United Nations organizations by declaring that—

in carrying out the objectives of this Act (Public Law 402), information concerning the participation of the United States

in the United Nations, its organizations and functions, shall be emphasized.

The objectives of FAO, to which so many countries are pledged, are to organize and develop agricultural production so as to raise the diets of the world's people to a health standard, and to stabilize prices of agricultural commodities at levels fair to producers and consumers alike.

The potential importance of such programs of agricultural technical collaboration as are authorized under Public Law 402 in implementing the active cooperation of the United States and other countries toward these agreed objectives may be illustrated by reference to certain declarations of the Report of the FAO Preparatory Commission on World Food Proposals, as follows:

To achieve the kind of economic expansion we envisage in this report, it will be necessary to ensure the maximum international co-operation and consultation. First, no one nation could undertake the task of agricultural and industrial development over such great areas of the earth, even if that were desirable. It can be done only by a combined use of material resources as well as of knowledge and technical skills. . . .

Nations have much to gain from developing scientific, technical, and other contacts with foreign countries. Improvement of agriculture can often be speeded by sending missions abroad to study particular methods and practices. Research



Copra production in the Philippines.

workers, technical officers, and administrators can widen their experience by foreign study. . . . In these various ways the countries embarking on development programs can discover valuable means of self-help. The actual arrangements will normally be made by the countries themselves. But FAO should keep itself informed of what is being done and may in some cases be able to provide services as a clearing house of information regarding facilities for such foreign visits and training.

The Commission recommends that member nations take opportunities of sending persons abroad and that governments of more advanced countries should extend pertinent facilities and courtesies including the provision of scholarships or special courses or other training to the visiting individuals or missions. We also recommend that member nations work out arrangements between their research institutes, laboratories, and government departments and corresponding agencies in other countries for the exchange of professional workers for a specified period of time.



Long Vegetable Fibers: Manila, Sisal, Jute, Flax, and Related Fibers of Commerce, by Ludwig Weindling. 311 pp., illus. Columbia University Press, New York, N. Y., 1947. The commercial aspects of the long vegetable fibers, as presented in this book, provide a valuable statistical background for those interested in this group of products. Also, they supply technical information and industrial statistics in one volume for ready reference. Three short introductory chapters deal with the uses and development of vegetable fibers, the characteristics of those fibers, and the economics of the long-fiber industry. The remainder of the volume is divided into two main sections; one is concerned with the "hard" and the other with the "soft" fibers. Manila hemp or abacá, sisal, hemp, and flax are treated in considerable detail, including a discussion of the characteristics and cultivation of the plants, together with the preparation, grading, uses, and marketing of the fibers, in each of the principal producing countries. Cordage and other hard-fiber manufactures are described in one chapter, and another is devoted to the cordage industry in general and that of the United States and Canada in particular.

Family Farm Policy, edited by Joseph Ackerman and Marshall Harris. 518 pp., illus. The University of Chicago Press, Chicago, 1947. This publication contains the proceedings of a conference on Family Farm Policy which was attended by participants from the British Commonwealth, northern Europe,

central Europe, Latin America, and the United States. The Conference was held at the University of Chicago, February 15-20, 1946. Tenure policy as it affects the family farm was discussed by 76 agricultural experts. Although the central subject of discussion was "the family-sized farm as a social and economic unit" in this country, participating speakers from other countries contributed by relating their experiences with other types of farm tenure. In the published material a chapter is devoted to each of a number of important agricultural countries in the regions mentioned above, several to the United States, and a concluding chapter deals with future prospects and methods of attacking problems related to land tenure and the farm family. The program of the conference, a list of the participants, and other data add interest to the volume.

Economic Report: Salient Features of the World Economic Situation 1945-47, issued by the Department of Economic Affairs, United Nations. 354 pp., illus. Columbia University Press, New York, N. Y., 1948. This report was published to meet the need of the General Assembly and the Economic and Social Council for an appraisal of world economic conditions and trends and contains valuable material related to food and agriculture. Four main divisions of the report are: World Economic Highlights, Regional Economic Conditions, Some Outstanding World Economic Problems, and International Action in the Economic Field.

Economic Development in Selected Countries: Plans, Programmes and Agencies, a report of the Department of Economic Affairs, United Nations. 286 pp. Columbia University Press, New York, N. Y., 1947. This report is first of a series on economic problems in some of the countries that are less well developed. The treatment is descriptive rather than analytical. No attempt is made to evaluate the governmental programs of the various countries, all of which are directed toward improvement of agriculture or other segments of the national economies.

World Food Situation, a Foreign Agriculture Circular WFP 1-48, OFAR, USDA. 59 pp., illus., Washington, D. C. 1948. This circular is a continuation of the world food summaries that OFAR has issued since 1945. The supply situation of food is discussed for major deficit- and surplus-producing countries of the world. The production and trade of essential food commodities for 1947-48 are summarized. The report also includes a brief statement regarding prospects for 1947-48 winter crops in the Northern Hemisphere.

Machine-Tractor Stations In the Soviet Union



by LAZAR VOLIN

Power farming made considerable strides in the Soviet Union during the decade preceding World War II. Its development accompanied collectivization of Russian agriculture undertaken by the Soviet Government, and, in fact, it contributed significantly to this process. While collective farms, or kolkhozy, as they are called in the Soviet Union, are supposed to be at least nominally self-governing producers' organizations (though actually they are rigorously controlled by the Government), mechanical power and most of the farm machinery are entirely state-controlled.

The Government owns and operates practically all tractors, combines, and other important farm implements. A small proportion of this mechanical equipment is on state-owned farms, so-called sovkhozy, but most of it is concentrated in special units called Machine-Tractor Stations (M. T. S.), which supply mechanical power and machinery to the kolkhozy. In 1940, of a total of 523,000 tractors on farms, 435,300 belonged to M. T. S. (9, p. 11).¹

A Soviet M. T. S., however, is not just a farm-machinery, custom-work agency but is a powerful arm of Soviet technical assistance, management, and control of collective agriculture, as well as a highly important fiscal instrument. Its role, therefore, in present-day Soviet agricultural economy can hardly be exaggerated.

Historical Sketch

The prototype of the modern M. T. S. made its appearance in 1927. In that year, the Shevchenko² state farm, located in the Odessa district of southern Ukraine and headed by an agronomist, A. M. Markevich, assigned 10 tractors, with the necessary agricultural implements and operators, to work, on a contractual basis, the land belonging to peasants of four neighboring villages. One of the requirements

of the contract was the voluntary pooling of the small, scattered peasant holdings into large fields suitable for tractor operations. Markevich, who was "purged" a few years later by the Kremlin, was the real pioneer of this important Soviet agricultural institution, both as an organizer of the first machine-tractor station and as an expounder and propagandist of the idea in a little book, published in 1929, which became a classic on the subject (7).

In 1928, this "inter-village" station, which began to be called a Machine-Tractor Station had 68 tractors and serviced 1,163 peasant holdings with a total area of close to 40,000 acres. In 1929, the number of tractors had increased to 140, and the station serviced 25 villages with a total area of about 125,000 acres (11, pp. 16-17). This station served as a pattern for the organization of other M. T. S., and they became an integral feature of Soviet collective agriculture. The Government, which in the late 1920's was bent increasingly on collectivization of Russian agriculture, was quick to see that the M. T. S. would be a powerful lever for accomplishing this objective. The M. T. S. appealed especially to the Government, because the pooling of tractors and other equipment provided for greater utilization of them at a time when Russian agriculture was severely handicapped by a critical shortage of draft power, resulting from the wholesale slaughter of horses and other livestock by the peasants during the forced collectivization campaign.

Establishment of M. T. S., both state-owned and cooperative, was encouraged by the Government, and in 1930 there were already 158 such units with over 7,000 tractors. On September 10, 1930, the Central Committee of the Communist Party decided that all the cooperative M. T. S. should be transferred to the state M. T. S. system. Even the state M. T. S. were organized, originally, as joint stock companies or corporations, with farmers contributing

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¹ Italic numbers in parentheses refer to literature cited, p. 86.

Statistics and other data are, as far as possible, for the more normal prewar period.

² Named after a famous Ukrainian poet of the middle 19th century.

at least 20 percent of the investment. But this feature was also soon eliminated. (For data on M. T. S., number and principal equipment, see table 1.)

Table 1.—Number of Machine-Tractor Stations in the Soviet Union, principal equipment, and work done, 1932, 1938, and 1940

Item	Unit	1932 ¹	1938 ²	1940 ¹
Machine-Tractor Stations	Number	2,416	6,358	7,069
Total tractors	Thousands	74.8	394.0	435.3
Total tractor power	1,000 H. P.	1,077.0	7,437.0	8,360.0
Total combines	Thousands	2.2	127.2	153.4
Total trucks	do	6.0	74.6	40.0
Ratio of kolkhoz sown area serviced by M. T. S. to total kolkhoz sown area	Percent	49.3	93.3	94.0
Total work performed by tractors, converted to plowing	Million acres	50.7	509.5	-----
Grain and sunflower acreage harvested by combines	do	.2	98.6	-----

¹ Data as of Dec. 31.

² Preliminary estimates, except for the number of M. T. S.

Source: M. T. S. VO VTOROY PYATILETKE (6, p. 11) and V. KHALTURIN (5, pp. 14-18).

Organizational Structure and Personnel

Each station has a central headquarters with offices, repair shops, etc. An M. T. S. services several kolkhozy, the number varying from station to station and region to region. (See table 2.) In 1937, an average M. T. S. serviced 33 kolkhozy with a sown area of nearly 46,000 acres. But the extent of variation in the number of kolkhozy serviced can be seen from the following figures (6, p. 23):

Number of kolkhozy serviced per M. T. S.	Percentage of total number of M. T. S.
10 and under	10.4
11 to 20	26.8
21 to 40	36.7
41 to 60	13.0
61 to 100	9.9
101 and over	3.2
	100.0

When measured by the number of tractors and total tractor power, the size of the M. T. S. more than doubled, between 1932 and 1938, and the work done per station nearly quadrupled during this period. But variations in these respects were also marked. For example, in 1937 about 10 percent of the M. T. S. had a tractor power up to 600 H. P. each, whereas 44 percent had over 1,200 H. P. In general, the problem of the effective size of the M. T. S. was not approached scientifically before the war (1, p. 42). An example of irrational distribution of M. T. S. is cited by a correspondent of *Pravda*,³ from the Tartar Republic,

³ June 22, 1939.

where a district had only one M. T. S. servicing 24 kolkhozy, whereas 40 kolkhozy relied entirely on horses. In addition to field work, the kolkhozy had a heavy transportation load. This district needed an additional M. T. S. One was established, however, in another district which had a smaller acreage and fewer kolkhozy, and which already had two M. T. S.

An M. T. S. is headed by a director, appointed by the Minister of Agriculture of the Soviet Union who alone has the legal power to dismiss him. This does not preclude, however, frequent dismissals by lesser authorities. There is a political vice director, whose functions are the same as those of the political commissars in the Red Army. An M. T. S. has a staff of mechanics, bookkeepers, and agronomists, as well as tractor drivers and combine operators, both of whom are recruited from members of the kolkhozy and trained for their work in special schools. The kolkhozy also provide all other labor necessary to help with the field work of the tractors and combines.

The M. T. S. are usually divided into several so-called tractor brigades, each consisting of three to five, or more, tractors with necessary implements and personnel. It is headed by a brigadier or foreman. A tractor brigade is usually assigned work in one or several adjoining kolkhozy.

The personnel of M. T. S. are paid wages by the state, with the exception of tractor drivers who are paid partly by the state and partly by the kolkhozy. The tractor drivers are credited with "work-days" (12, p. 152) as are other members of the kolkhozy, but at a higher rate for fulfilling their daily tasks. They receive liberal bonuses for exceeding them. Unlike other members of the kolkhozy, however, tractor drivers are guaranteed a certain minimum of cash and bread grain per "work-day," except in kolkhozy specializing in production of fruits, vegetables, and certain industrial crops, in which the cash minimum is raised in lieu of bread grains. The cash minimum of 2.5 rubles per "work-day" is paid by the state.

TABLE 2.—Average size of Machine-Tractor Stations in the Soviet Union, 1932, 1935, 1938

Average per M. T. S.	Unit	1932	1935	1938
Number of kolkhozy serviced	Number	29	28	32
Sown area	1,000 acres	45.5	41.3	42.5
Tractors	Number	30.6	58.2	62.0
Tractor power	Horsepower	440.3	978.7	1,169.7
Tractor plows	Number	-----	48.9	59.9
Tractor disk harrows	do	-----	4.7	-----
Tractor grain drills	do	-----	15.7	29.0
Combines	do	.9	6.7	20.0
Threshers	do	-----	18.5	13.6
Work done converted to plowing equivalent	1,000 acres	20.8	56.8	80.1

Source: T. BASYUK (1, pp. 93-94)

The grain minimum paid by the kolkhozy was 3 kilograms (6.6 pounds) per "work-day," but since 1947 this amount has been distributed only if the planned goal for the yield per acre on the plots worked by tractor brigades is achieved and the work of preparation for the next harvest is done on time; otherwise, the minimum is 2 kilograms (4.4 pounds) per "work-day." The kolkhozy are supposed to make up the difference between the guaranteed minimum and the amount of cash and produce which they distribute per "work-day" to their members.

At the end of 1937, the M. T. S., including repair shops, had the following personnel (6, p. 90):

	Number (thousands)	Percentage of total
Tractor drivers.....	685	48.8
Tractor brigadiers.....	96	6.8
Combine operators.....	82	5.8
Chauffeurs.....	56	4.0
Permanent repair-shop workers.....	99	7.1
Other workers.....	214	15.3
Agronomists.....	33	2.4
Engineering personnel.....	40	2.8
Administrative personnel.....	98	7.0
Total.....	1,403	100.0

Frequent turn-over of personnel in the M. T. S. was a problem which constantly bedeviled the administration during the prewar period. Arrears in payment of wages and poor living conditions were frequently mentioned in the Soviet press as causes of dissatisfaction and turn-over.

Wholesale fining of tractor drivers was another cause of turn-over. An example was cited of an M. T. S. where, in 1937, 204 tractor drivers left because of such a practice.⁴ There were many cases in which trained tractor drivers worked at other trades in the kolkhozy, despite shortages of such personnel in the M. T. S.⁵ Shortage of tractor drivers and combine operators, especially in the eastern regions, such as Siberia, was chronic before the war. It necessitated each year the transfer of personnel from the south, where the harvest was completed early, to regions of later harvest. In the summer of 1940, the Government issued a decree prohibiting workers in the M. T. S. from leaving their posts, without permission of the authorities, on penalty of imprisonment of from 2 to 4 months on conviction by a court. Similarly, absenteeism and tardiness are punished by so-called "corrective" or forced labor, up to 6 months in the

unit in which the person is working, with a deduction of 25 percent in wages.

Special schools and courses have been established for the training of M. T. S. personnel. However, as an editorial in the organ of the Soviet Ministry of Agriculture—*Socialist Agriculture* for June 26, 1939—stated: "It is not a secret that in many schools and courses, the training of personnel is organized in an entirely unsatisfactory manner."

A tendency, which was acknowledged by Soviet spokesmen as baneful, has been the encouragement given by authorities to some individual tractor and combine operators to make high records of performance, with little attention paid to the other workers. The result is that the so-called stakhanovists⁶ or shock workers greatly exceed the performance of their fellow workers, with consequently much larger earnings, whereas the average productivity per worker remains low. As one writer (3, p. 26) put it, answering his own question—

What is, then, the explanation of the abnormal situation in which the average daily amount of work per combine of many M. T. S. and state farms is three to four times lower than that of the stakhanovists working in the same units? One of the basic reasons for this is that the managers of the M. T. S. did not observe the most important directive of the Communist Party and the Government—that the strength of the stakhanovist movement lies in its mass character. Often the managers, in striving to encourage high records of individual workers, poorly direct the rank and file of combine operators, do not create the necessary organizational and technical conditions for efficient work on combines, do not provide the necessary assistance for the adoption of the stakhanovist methods of increased productivity of labor, even though large numbers of combine operators are anxious to work in the stakhanovist manner.

The great disparity in the amount of work done per year may be gathered from the fact that, although nearly two-thirds of the combine operators harvested up to 865 acres each in 1937, about 6 percent harvested over 1,500 acres each with earnings increasing more than proportionately under the bonus system adopted. A similar situation prevails more or less with respect to other types of work.

Operation

The amount of work to be done by the M. T. S. each year is determined, as in the case of all other state enterprises, by the Government plan. In addition, an M. T. S. is supposed to conclude agreements with the kolkhozy each year specifying in detail its

⁴ *Socialist Agriculture*, January 11, 1939.

⁵ *Socialist Agriculture*, October 6, 1939; *Izvestiya*, January 11, 1940.

⁶ From the name of Alexei Stakhanov, a Russian miner, who originated, in 1935, a movement for increased efficiency of labor on the basis of scientific management, which, however, often degenerated into a speed-up, pace-setting system.



The majority of the Soviet kolkhozy are serviced by M. T. S.

services; that is, the kind, the amount, and the time of the work to be performed. Likewise, the contribution which the kolkhoz is to make, such as the amount of labor to be assigned to help the M. T. S. in its field work, etc., is stated in the agreement. These agreements follow a certain standard form, approved by the Government.

In practice, however, the agreements were either not lived up to or not even concluded at all. As A. A. Andreev, a member of the powerful Politbureau governing the Communist Party, stated:

Some M. T. S. have stopped entirely making agreements with the kolkhozy, and others conclude such agreements with much delay and only as a formality, the agreements made not being observed.

The provisions of the agreements have often been violated. For instance, a special order of the Ministry of Agriculture of the Soviet Union of May 9, 1947, censured serious violations on the part of two M. T. S. in the Tartar Republic.⁷

Most, but not all, of the kolkhozy are serviced by M. T. S. In 1937, 78 percent of the total number of kolkhozy, representing 91 percent of the total kolk-

hoz sown area, were serviced by M. T. S. But, the proportion was as high as 98 percent of all kolkhozy in the Ukraine and Middle and Lower Volga area and as low as 42 percent in the Georgian Republic in Transcaucasia. (See map.) By 1940, the proportion of the sown area of the kolkhozy serviced by M. T. S. increased to 94 percent of all the collective area sown.

The mechanization of farm work varies among different operations and different regions. (See table 3.) The greatest extent of mechanization before the war was achieved in plowing, which of course is the heaviest type of farm work. Some important farm operations, such as haying, were little mechanized, notwithstanding the usefulness of machines in avoiding delays and other difficulties which usually beset the hay harvest, and which affected adversely the much-needed forage supply. Mechanization is more advanced in the southern and eastern steppe regions than in the north and west.

For example, in southern Ukraine, North Caucasus, and Lower Volga areas, from 90 to 100 percent of the spring plowing in the kolkhozy was done by tractor power in 1937. But, farther north in Gorki Province the proportion was only a little over half, in Smolensk

⁷ *Socialist Agriculture*, May 11, 1947.

a little over 40 percent, and in Vologda Province less than 40 percent. In the sowing of spring grains, variations in the use of tractor power were greater and likewise between nearby regions of the same geographic zone. Thus, in Voroshilovgrad Province of southern Ukraine, in 1937, 88 percent of the kolkhoz spring-grain area was seeded by tractors and only 58 percent in Dnepropetrovsk Province. But, in Gorki Province it was less than 3 percent, in Smolensk 8 percent, and in Vologda 4.5 percent.

The lack of proper proportion between the number of tractors and other machinery was given by an official of the Soviet Ministry of Agriculture as an important cause for the lag noted in the mechanization of a number of farm operations. For example, on January 1, 1938, there were only 32 grain drills, 27 cultivators, 27 combines, etc., per 100 tractors of 15 H. P.⁸ The disparity between the mechanization of the south and the north, noted above, was attributed by the same authority partly to the lack of sufficient tractors and combines adapted for operation on the small scattered fields of the northern regions, for which the large machines, found advantageous in the southern steppes, are not suitable.⁹

A stock claim of Soviet spokesmen has been that tractors are more effectively utilized in their country than in the United States and other countries because of longer use during the year.¹⁰ Much of this advantage in the Soviet Union is, however, offset by the use of several workers where one would do the job in the United States; by frequent break-downs and stoppage of tractors and combines during the working time as a result of poor care, inexperienced or inefficient operators, poor repair work, shortages of spare parts and fuel, and other factors. Inadequate care of tractors and other machinery and in many cases lack of M. T. S. storage facilities, necessitating that the machines remain in the open air all the year round, have contributed to excessive wear and tear on machinery. Every winter the repairing and overhauling of tractors and combines have been of major

concern. Still, in 1940, 15 percent of all M. T. S. had no workshops for current repairs (5, p. 15).

Table 3.—Percentage of work done on Soviet collective farms by tractor power, 1938 and 1940

Type of work	1938	1940
	Percent	Percent
Plowing for spring crops	74.7	
Sowing of all spring crops	43.9	52.0
Sowing of spring grains and legumes	46.4	
Sowing of cotton	65.5	
Planting of sugar beets	95.0	
Planting of potatoes	4.1	
Harvesting of all grains and legumes with all types of harvesting machinery, including combines	45.0	46.0
Harvesting of all grains with combines only	42.1	
Harvesting of small grains with combines	45.9	
Harvesting of flax for fiber	19.8	
Digging of sugar beets	79.5	
Preparation of fallow	82.5	84.0
Sowing of winter crops	50.3	53.0
Full plowing	71.9	71.0

¹ Data for 1937.

Source: M. T. S. VO VTOROI PYATILETKE (6, pp. 83, 85) and V. KHALTURIN (5, pp. 14-18).

One cannot deny that without the M. T. S. system of power farming Soviet agriculture could hardly have been able to increase the crop acreage by 20 percent between 1927 and 1937, or even to maintain it at the 1927 level in the face of a severe shortage of animal draft power caused by the policy of agricultural collectivization. On the other hand, the M. T. S., in the chase for more and more acres, neglected the qualitative aspect of farming as represented by improvement of yields. As A. A. Andreev expressed it—

Our Machine-Tractor Stations are little interested in improvement of yields, in good soil management, in timely seeding and harvesting. The existing system of evaluation of the work of M. T. S. in terms of hectares converted to plowing equivalent, and the system of incentives for the M. T. S. personnel, results in the M. T. S. striving to complete as many light operations as possible instead of the difficult plowing work.

Andreev continued—

One must ask what good do the state and kolkhozy derive from such a fulfillment of their plan by M. T. S. if it results in low yields? The objective, after all, is not just to dig the soil a little but to create actual conditions for growing a good crop and to harvest it in good time with combines.

Although the amount of fuel used per acre of tractor work converted to plowing equivalent decreased by one-third between 1933 and 1937, wasteful use of fuel has been a constant source of complaint in the Soviet literature on M. T. S. It is caused by unsatisfactory adjustment of machines, wasted motion, lack of proper fueling equipment and inadequate, or poor, storage and transportation facilities. The importance attached to this problem stems from the fact that fuel has been the largest element in the cost of tractor

⁸ A 15-H. P. tractor is employed in the Soviet Union as a standard statistical unit for measuring tractor power.

⁹ M. Moiseev, *Pravda*, February 21, 1939.

¹⁰ The average tractor use in the Soviet Union in 1938 varied regionally from 800 to over 1,600 hours. In the United States, average tractor use in 1940 varied from 372 hours in the southern Atlantic States to 653 hours in Texas and Oklahoma and averaged 493 hours for the country as a whole (8, pp. 50, 55). See also BRODELL, A. P., and COOPER, M. R. FUEL CONSUMED AND WORK PERFORMED BY FARM TRACTORS. U. S. D. A., Bur. Agr. Econ., F. M. 32, 29 pp., illus. Washington. 1942. [Mimeographed.]

work. In 1937 it accounted, together with lubricants, for 55.9 percent of the total expenditures of M. T. S., as against 7.3 percent for wages, 9.9 percent for repair and overhauling of tractors and combines, 2.3 percent for repair of other machinery, 14.4 percent for administrative expenses, and 0.9 percent for other expenses. Moreover, agriculture—and this means principally M. T. S.—was the most important consumer of petroleum products, accounting, according to a statement made early in 1939, for 60 percent of total consumption, over 60 percent of the production of kerosene, and 80 percent of the distillate (2, p. 142).

Special bonuses for M. T. S. workers for economizing in fuel use were instituted, but the result was that lighter work, in which less fuel was consumed, was often performed at the expense of more important, heavier fuel-consuming work. (See table 4 for data on fuel consumption in different operations.)

Payment for Services

The M. T. S., which are financed both with respect to their capital and current expenditures from the state budget, as a rule are paid in kind for their services to the kolkhozy. They receive cash for only certain minor operations. The bulk of payments are in grain, cotton, flax, etc., at a specified rate for each operation. This rate, however, varies with the officially estimated yields of crops per acre, increasing with higher yields. Beginning in the 1947 season, the rate of payment was reduced in case of delay in the work performed, which has often characterized the operations of the M. T. S., with consequent adverse effect on crop yields.

For purposes of determining the variation in the rate of payment to M. T. S. in accordance with yields of crops, the kolkhozy are divided into several groups, according to the yield per acre. Assignment to the various yield groups is not by individual collective farms, but by whole districts (raions, corresponding roughly to counties in the United States)

Table 4.—Consumption of fuel per area worked by all types of tractors in the Soviet Union, 1937

Type of work	Consumption of fuel
	Pounds per acre
Spring plowing	17.7
Harrowing	1.5
Spring sowing	4.3
Cultivation	3.7
Harvesting by combines	9.8
Harvesting of beets	13.7
Pulling of flax	15.3
Preparation of fallow	17.0
Autumn plowing	17.8

Source: M. T. S. VO VTOROY PYATILETKE (6, p. 114).

so that all kolkhozy in a particular district are in one group as far as payments to M. T. S. are concerned, even though there are actual differences in yields among them. Only when differences in yields as between different kolkhozy in the district are considerable is an exception permitted in favor of individual collective farms.

An important fact to remember is that the officially estimated, published Soviet figures of yields per hectare of crops¹¹ since 1933 are not comparable with those for the preceding years or with similar figures in the United States and other countries. The Soviet crop figures do not refer to the harvested crop actually in the barn or the bin. They are pre-harvest figures, based on the standing crop, and do not take into account the heavy harvest losses common in the Soviet Union. Thus, the official estimates of crop yields (on the basis of which the kolkhozy pay in kind to the M. T. S.) are invariably higher than the actual harvested outturn of the crop, even when there is no exaggeration for propaganda or fiscal purposes, from which the figures cannot be considered free. Under such conditions, payments to M. T. S. are especially burdensome in years of poor crops.

The payments in kind to M. T. S. make up an important part of the grain and other farm products acquired by the Government. Grain obtained as payment for the work of the M. T. S. constituted, on the average, 36 percent of total grain procurements from the kolkhozy during the years 1935 and 1937. The ratio of payments to M. T. S. to the total grain crop of the kolkhozy increased from 13.9 percent in 1937 to 16 percent in 1938 and 19.2 percent in 1939, exceeding in all those years the compulsory procurements¹² of grain (tax in kind).

Thus, M. T. S. perform not only an important technical and managerial but also a fiscal function in Russian agricultural economy. The importance of M. T. S. in the Soviet scheme of things is, moreover, augmented by the fact that they constitute the main technical prop of collectivization, which has enabled the Government to acquire huge quantities of low-cost farm products needed to feed and clothe, albeit at a low level, the growing industrial population; to provide raw materials for the expanding industry; and to supply exports required to pay for imported industrial equipment and raw materials. As for the peasants themselves, there is no available

¹¹ One hectare is equal to 2.471 acres.

¹² Compulsory procurements are 20 percent less for kolkhozy serviced by M. T. S. (12, p. 149).

evidence to indicate that economically those in kolkhozy serviced by M. T. S. fare differently from those not serviced.

The War and Postwar Period

The war caused heavy damage and destruction to the M. T. S. in the invaded zone, where over 40 percent of these units were located. M. T. S. in the uninvaded zone were also adversely affected by war mobilization of tractors and experienced personnel and by the lack of replacements for worn-out machinery. Two of the three Soviet tractor plants in Stalingrad and Kharkov were destroyed, and the factory in Chelyabinsk shifted to production of tanks (4, p. 10). Tractor power in the M. T. S. decreased from 8,400,000 H. P. in 1940 to 6,000,000 H. P. at the beginning of 1947.¹³ The combined draft power, tractor and animal, in M. T. S. and kolkhozy decreased from 14,000,000 H. P. in 1937 to 10,200,000 at the beginning of 1947. The age, and often worn-out condition, of machinery, because of absence of replacements and adequate repair during the war years, aggravate the situation. As for animal draft power, the number of horses in the whole present territory of the Soviet Union, including the newly acquired regions, on January 1, 1947, was only a little over half that in 1938. On January 1, 1949, it is expected to be somewhat less than two-thirds of the 1938 figure.

The postwar Five-Year Plan, announced in the spring of 1946, calls for the establishment by 1950 of 950 new M. T. S. in addition to restoration of those which were destroyed, or damaged, and for supplying agriculture with 325,000 tractors, 174,000 combines, and other farm machinery, most of which is destined for M. T. S. But new tractors and farm machinery were slow in reaching the farms in 1946, because Soviet industry failed to fulfill the production plan. Only about 14,000 tractors were produced in that year by the partly restored plants in Stalingrad and Kharkov, the Chelyabinsk plant, and two new plants built during the war—one in Altai Province of Siberia and another in Vladimir, northeast of Moscow. An improvement occurred in 1947, but the 30,300 tractors called for by the 1947 Government program constitute only a little over a third of the average number delivered to farms during the period 1933–38 (10, p. 12).

¹³ The figure for 1940 was given by V. Khalturin (5, p. 14); the 1947 figures are from the speech of A. A. Andreev, in *Pravda*, March 7, 1947.

Soviet agriculture is, therefore, still experiencing a serious shortage of draft power and machinery. This enhances the role of the M. T. S. as an agency for pooling and economizing power and equipment. Moreover, M. T. S., which have been organized as custom-work units in the newly acquired regions, where individual farming still prevails, are destined to become, perhaps, the most potent weapons in the process of agricultural collectivization that has already slowly begun.

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INTERNATIONAL *Agricultural News*

Mexican Scientist Participates In International Exchange Program

Miss Anita Hoffmann, of the Institute of Health and Tropical Diseases of Mexico, has come to the United States to study for 3 months the parasitic chigger mites and their relation to man and animal as disease carriers. She spent 2 weeks at Duke University, Durham, N. C., and the Wake Forest-Bowman Gray Medical School, Winston-Salem, N. C., with Drs. Wharton and Fuller, two of the leading scientists on this problem. She arrived in Washington on February 5, and is devoting the remainder of her stay to study with Dr. E. W. Baker, Acarologist of the Bureau of Entomology and Plant Quarantine. Miss Hoffman's trip to this country was arranged through the Exchange-of-Persons Division of the Interdepartmental Committee, U. S. Department of State, with the Mexican and United States Governments cooperating on the program for exchange of scientists and experts.

Coffee-Disease Studies In Costa Rica

Intensive research on coffee diseases now under way for the Government of Costa Rica, at the Inter-American Institute of Agricultural Sciences in Turrialba, holds promise for the development of more efficient cultural practices for this important complementary crop.

Dr. Frederick L. Wellman, pathologist on the staff of the Office of Foreign Agricultural Relations, United States Department of Agriculture, for the past several months assigned to these studies, recently described the results of his research on the subject of shading of coffee trees in relation to distribution and incidence of the more important coffee diseases of this hemisphere.

Although shading of coffee trees has long been recognized as essential to high yields, Dr. Wellman's work is unique in that he analyzes the various degrees of shade in relation to production and vigor and correlates the results with the effect of shade on the occurrence of diseases and pests.

Greater Crop Production On the Bolivian Altiplano

Increased production of forage crops, wheat, barley, quinoa, and potatoes on the Bolivian Altiplano is to be encouraged, if plans of the Minister of Agriculture of the Bolivian Government materialize. A current project is the irrigation of some 17,500 acres of land in the Huarina-Peña region (on the Altiplano near Lake Titicaca).



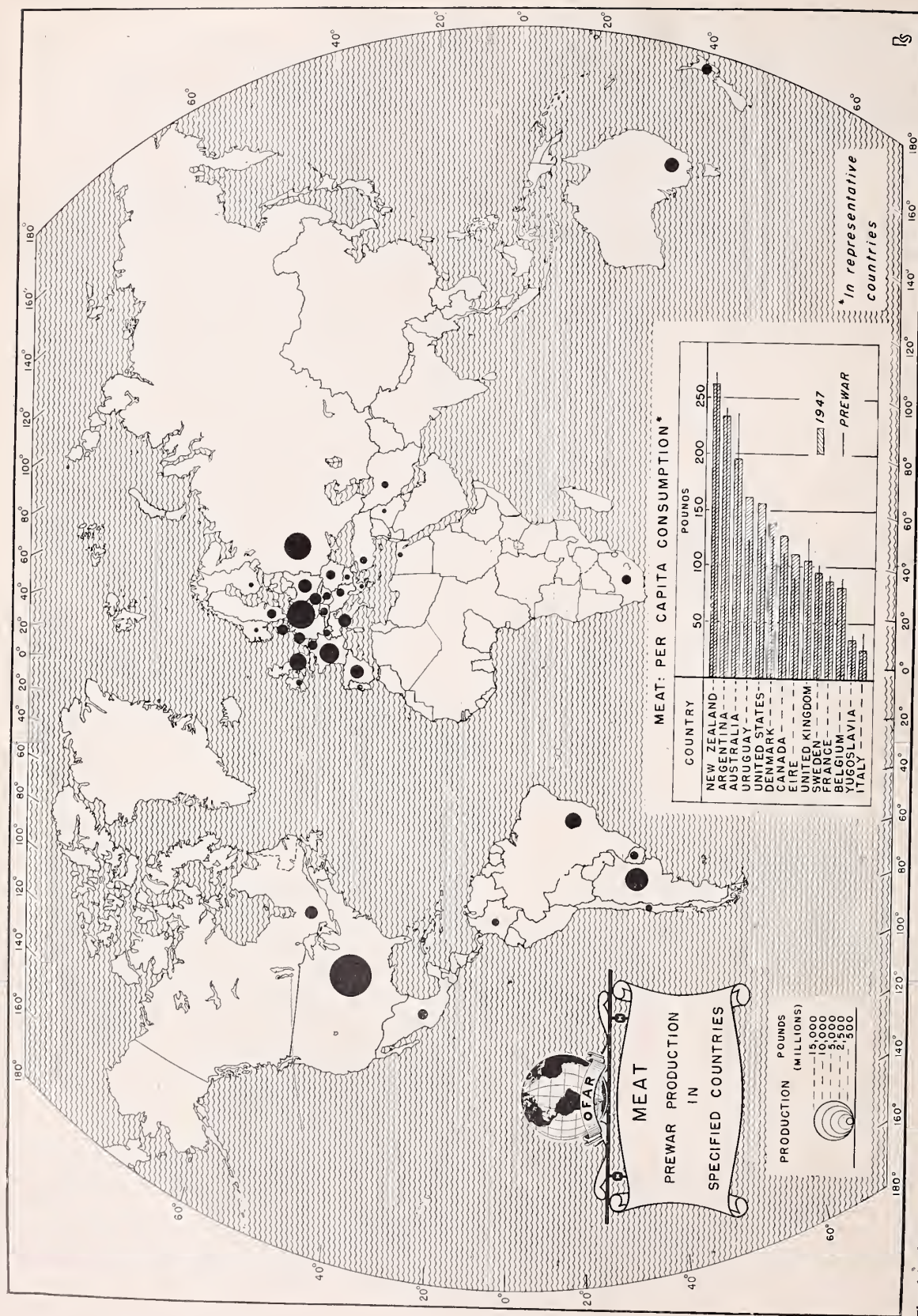
CINCHONA

The bark from the cinchona tree is the natural source for medicinal quinine and several other alkaloids. This tree, which is native to the Andean region of the American Tropics, was transplanted to the Far East by the English and the Dutch in the middle of the nineteenth century. There it flourished in well-tended plantations, and before World War II the Netherlands Indies alone accounted for 84 percent of total world production of cinchona bark. Bolivia was the most important Latin American supplier. Quinine sulfate, a specific for malaria, is the principal product of the bark, although it also yields small quantities of quinidine, used in certain heart ailments; cinchonine, cinchonidine, and other medicinal alkaloids.

Before the war most of the Latin American production came from wild cinchona trees, whereas that of the Far East was largely from plantation growth. Cultivated plantings are increasing in Latin America, however, and output, particularly from Guatemala, is expanding. Whether produced from seedlings or grafting, the trees require several years to mature sufficiently so that the bark can be harvested. About 10 years are required between planting of seedlings and peak harvesting.

The bark gatherers fell the tree, strip off the bark, dry it, and pack it for marketing. Part of the cinchona from the Netherlands Indies is exported as bark, and the alkaloids removed either in the Netherlands or the consuming country; part is processed in the Netherlands Indies and the products shipped. Most of the world trade in cinchona and its products has been controlled by a cartel known as the Kina Bureau.

United States prewar imports of bark averaged 1,777,000 pounds in 1935-39, and imports of alkaloids (in terms of bark) averaged slightly less than that quantity. All came, either directly or indirectly, from the Netherlands Indies. During the war, however, when supplies from the Far East were unavailable, Latin America furnished us limited quantities. In 1946 Guatemala sent us three-fourths of our small import. By 1947 Netherlands Indies production was again on the market and furnished us the greater part of a larger total. With the perfection of atabrine and other synthetic medicinals, chemists have forged a new tool for the treatment of malaria by the combined use of quinine and synthetics.



The black circles represent the total average prewar meat production in the various countries. Meat production, shown above, which included beef, veal, pork, mutton, lamb, goat, and horse meat, amounted to more than 66 billion pounds for the prewar period 1934-38. The inset bar chart shows meat consumption per capita in the representative countries for 1947 and the prewar period. Quantitative variations in meat production effect the consumption per capita in proportion to the highly variable population situation in the various countries.

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